

REMARKS

Claims 1-20 are pending in the instant application. In the most recent Office Action, claims 1-20 are rejected under 35 U.S.C. § 103(a) as allegedly obvious over U.S. Patent No. 5,631,644 to Katata, et al. (hereinafter, "Katata") in view of U.S. Patent No. 6,055,330 to Eleftheriadis, et al. (hereinafter, "Eleftheriadis"). Applicant respectfully traverses the rejections for at least to reasons set forth below.

Independent claims 1 and 11 recite an apparatus and method, respectively, for variable bit rate video encoding of video data comprising, *inter alia*, calculating average complexity of whole coded data from the quantization step size provided to the video coding means and also the generated code bit count provided from the video coding means and setting a reference quantization step size for each first image unit, corresponding to the target average bit rate from the average complexity.

The Office Action offers Katata as disclosing variable bit rate video coding. However, Katata is based on the control of CBR (Constant Bit Rate) such as to provide a substantially constant code quantity in GOP units, and is not a system for coding at VBR (Variable Bit Rate) (See, Col. 1, lines 39-50). Although Katata teaches that in picture units the desired code quantity per picture is determined based on the picture type (Col. 3, lines 10-25), this means fine control at the picture level. Since the coding efficiency usually varies in dependence on the picture type, only the code quantity allotted to a GOP is proportionally distributed based on the coding efficiency. Thus, in Katata's method the allotment of a constant code quantity is controlled for the GOP and above layers, and usually the system is for coding at CBR (Constant Bit Rate).

The control at VBR (Variable Bit Rate) according to the present invention is distinguished, in that the code quantity is made variable even for the GOP and above layers. Although so-called variable-length encoding is involved in the coding process of Katata, this only shows a code transforming means for transforming separate data to be encoded to variable-length code words when generating a bit train as the encoded data, and is not relevant to the control at VBR.

Moreover, for the setting of the reference quantization step for the first image units, according to the claimed invention a reference quantization step is set corresponding to a target average bit rate and average picture complexity. In contrast to the claimed invention, Katata teaches that the quantization step size is determined in macro-block units, corresponding to the virtual buffer fullness (Col. 3, line 10 - Col. 4, line 12).

Thus, Katata controls the generated code quantity to a predetermined desired value for picture units, realized by fine feedback in macro-block units. However, since Katata's code quantity is constant in GOP units, code quantity distribution according to the complexity of scene is not achieved. Therefore, in the constant bit rate control for allotting a constant code quantity in GOP units, a sufficient code quantity may not be allotted even with a complex scene, i.e., a scene requiring a large code quantity, or a wasteful code quantity is consumed even with a simple scene, i.e., a scene requiring only a small code quantity. In Katata, the wasteful data is generated due to the insertion of dummy data for small code quantities (Col. 6, lines 35-50).

According to the present invention, the reference quantization step is set corresponding to the target average bit rate from the average complexity, thus allowing variation of the generated code quantity while maintaining a substantially constant image quality.

The Office Action admits that Katata does not teach calculating the average complexity of the whole coded data from the quantization step size provided to the video coding means. The Office Action offers Eleftheriadis, specifically Fig. 3, as evidence that this feature is well known in the art. Applicant respectfully disagrees.

In the first instance, Fig. 3 of Eleftheriadis and the accompanying text (e.g., Col. 8, lines 17-39) merely describes a conversion from a variable bit rate encoder output to a constant rate output. Rate control is executed by calculating the quantization factor according to the buffer capacity, thus obtaining a constant bit rate output. However, the method of calculating the reference quantization step from the average complexity as recited in the present invention is not shown.

Elsewhere, Eleftheriadis describes merely a method where the quantization step is allotted for each macro-block in correspondence to the result of raveling, and the calculation of the average coding complexity of the entire image data coded so far is not involved (Col. 11, lines 39-52). Eleftheriadis teaches that by comparison with image depth data, the quantization step is set finer for objects closer to the camera, and coarser for those further away. Therefore, in the Eleftheriadis method, although the code quantity distribution in the image is adjusted, the code quantity distribution according to the feature of scenes changing in the time direction is not realized.

It has been held by the courts that to establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. See *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Therefore, as demonstrated above, neither Katata nor Eleftheriadis, taken individually or in any combination, teaches or suggests at least setting a

reference quantization step size corresponding to a target average bit rate from the average complexity, as recited in claims 1 and 11.

Claims 2-10 and 12-20 each depend from independent claims 1 and 11, respectively. These claims are each separately patentable, but are offered as patentable for at least the same reasons as the underlying base claims on which they depend. Therefore, Applicant respectfully submits that the rejection of claims 1-20 has been obviated, and kindly requests favorable reconsideration and withdrawal of the rejection.

In the interest of brevity, Applicant has addressed only so much of the rejection as is considered necessary to demonstrate the patentability of the claims. Applicant's failure to address any part of the rejection should not be construed as an acquiescence in the propriety of such portions not addressed. Applicant maintains that the claims are patentable for reasons other than these specifically discussed, *supra*.

In light of the foregoing, Applicant respectfully submits that all claims recite patentable subject matter, and kindly requests and indication of allowability of all claims. If the Examiner has any reservation in allowing the claims, and believes that a telephone interview would advance prosecution, he is kindly requested to telephone the undersigned at an earliest convenience.

Respectfully submitted,



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